

Appendix 4-3: Water Year 2013 Supplemental Evaluations for Regulatory Source Control Programs in Non-Everglades Construction Project Basins

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INTRODUCTION

For the seven non-Everglades Construction Project (non-ECP) basins, the Florida Department of Environmental Protection Permit Number 06, 502590709 requires that the South Florida Water Management District (District or SFWMD) reports on the status of required water quality monitoring to evaluate progress toward achieving established water quality standards and the effectiveness of source control strategies. The data collection requirements for structures associated with the non-ECP basins are outlined in the non-ECP permit. Chapter 3A of this volume and Volume III, Appendix 3-2, provide the Water Year 2013 (WY2013) (May 1, 2012–April 30, 2013) update on the District’s data collection efforts for non-ECP structures. This appendix summarizes the flow, total phosphorus (TP) load, and flow-weighted mean (FWM) TP concentration at each non-ECP basin discharge structure for WY2004 through WY2013. The flow, TP load, and FWM TP concentration at each non-ECP basin discharge structure before WY2004 are presented in Appendix 4-3 of the *2013 South Florida Environmental Report (SFER) – Volume I*.

NON-ECP BASIN SUPPLEMENTAL EVALUATION

BASIN-LEVEL MONITORING DATA

During WY2013, eight structures served as direct or indirect discharge points from the non-ECP basins into the Everglades Protection Area (EPA). While seven of these structures are within the control of the District and are referred to as “into” structures under the non-ECP permit, this appendix also incorporates flow and TP data for the remaining private structure, NSID1. Since December 2006, all runoff from the Acme Improvement District (Acme) Basin has been discharged into the C-51 West canal and then generally directed to Stormwater Treatment Area 1E (STA-1E). Direct untreated flows from the ACME1 and ACME2 structures into Water Conservation Area (WCA) 1 no longer occur under normal conditions. The Acme Basin is now

designated as an Everglades Construction Project (ECP) basin; however, this appendix includes the historical discharge information for this basin.

On August 27, 2012, as Tropical Storm Isaac moved into the Gulf of Mexico, a nearly stationary feeder band produced an average of 8.6 inches of rainfall with local maxima of 12.8 inches over the Lower East Coast from Broward County to the Treasure Coast and into Central Florida with a heavy focus on Palm Beach County, Florida. The C-51 Basin in Palm Beach County was one of the hardest hit areas where 14.7 inches of rain fell over 72 hours from August 26-28. As a result of the flood hazards within the Village of Wellington (VOW) caused by this precipitation, discharges through the G-94D structure occurred from August 28 to August 31. During this period, G-94D discharged approximately 1,231 ac-ft of water and 211 kg of total phosphorus with a flow-weighted mean TP concentration of 139 ppb to WCA-1.

Table 1 of this appendix summarizes the annual total flow, total TP load, and FWM TP concentration for each structure. The individual aggregated structure summaries represent the collective discharge into a given receiving water body. The receiving water bodies include WCA-1, WCA-2A, WCA-3A, and Everglades National Park. The individual and aggregated structure summaries for non-ECP basins are presented for WY2004 through WY2013. Volume III, Appendix 3-2, presents WY2013 water quality sampling statistics for these non-ECP basin discharge structures.

BASIN-LEVEL WATER QUALITY SUMMARY

This section summarizes the water quality results for the non-ECP basins. These basins include the Feeder Canal, L-28, C-111, C-11 West, North New River Canal, and North Springs Improvement District. Historical water quality results for the Acme Basin are also included. Since December 2006, this basin has discharged to the C-51 West canal and is now designated as an ECP basin. Each figure in this section includes daily, monthly, and annual data for each basin. **Figures 1, 3, 5, 7, 9, 11, and 13** summarize daily rainfall and monthly TP load, FWM TP concentration, rainfall, and flow volume in WY2013 for each basin. **Figures 2, 4, 6, 8, 10, 12, and 14** summarize the annual TP load, FWM concentration, rainfall, and flow volume through WY2013 for each basin. The water quality summary for each basin is discussed in further detail in Chapter 4 of this volume.

UPSTREAM (SUB-BASIN) LEVEL WATER QUALITY SUMMARY

Water quality, particularly TP concentrations, in Everglades non-ECP basins and the Acme Basin is monitored at the upstream sampling sites to identify high phosphorus areas within each basin. This section includes maps summarizing the water quality data for grab and auto-sampler sites for most non-ECP basins. Water quality data is included for sampling sites within the North Springs Improvement District Basin; C-11 West Basin consisting of South Broward Drainage District, Central Broward Water Control District, and Indian Trace Development District; Boynton Farms Basin; Feeder Canal Basin (West Feeder sites, PC-17A, G-108, and WWeir); and L-28 Basin (USSO and L-28U). Removal of the G-108 structure eliminated discharges to the North Feeder Canal at its location in April 2010. **Figures 15 through 19** present the upstream sampling sites and average TP concentration in the North Springs Improvement District and C-11 West (South Broward Drainage District, Central Broward Water Control District, and Indian Trace Drainage District), North New River Canal (west), respectively. **Figures 20 through 24** summarize the annual TP load, FWM TP concentration, and flow volume for upstream structures in the Feeder Canal Basin. **Figures 25 through 27** summarize the annual TP load, FWM TP concentration, and flow volume for upstream structures in the L-28 Basin. **Figures 28 through 30** present the upstream sampling sites and average TP concentration in the Boynton Farms, C-111, and Acme basins, respectively.

Table 1. Water Years 2004 through 2013 (WY2004–WY2013) (May 1, 2003–April 30, 2013) non-Everglades Construction Project (non-ECP) basins structure total flow volume, total phosphorus (TP) load, and TP flow-weighted mean (FWM) concentration to the Everglades Protection Area by tributary basin.
[Note: kac-ft = thousand acre-feet, mt = metric tons, ppb = parts per billion]

Non-ECP Basin Structures into Water Conservation Area 1 (WCA-1)											
	Water Year	2004	2005	2006	2007	2008 ¹	2009 ¹	2010 ¹	2011 ¹	2012 ¹	2013
ACME1	Flow Vol. (kac-ft)	10.02	12.32	14.16	13.61	0	0	0	0	0	0
	TP Load (mt)	0.96	2.02	1.40	1.97	0	0	0	0	0	0
	TP FWM (ppb)	77	133	80	117	NF ²	NF	NF	NF	NF	NF
ACME2	Flow Vol. (kac-ft)	9.87	11.25	12.77	12.71	0	0	0	0	0	1.23
	TP Load (mt)	1.23	2.95	1.83	2.22	0	0	0	0	0	0.21
	TP FWM (ppb)	101	212	116	141	NF	NF	NF	NF	NF	139
Total (WCA-1)	Flow Vol. (kac-ft)	19.89	23.56	26.93	26.32	0	0	0	0	0	1.23
	TP Load (mt)	2.18	4.97	3.24	4.18	0	0	0	0	0	0.21
	TP FWM (ppb)	89	171	97	129	NF	NF	NF	NF	NF	139

Non-ECP Basin Structures into Water Conservation Area 2A (WCA-2A)											
	Water Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
NSID1 Total (WCA-2A)	Flow Vol. (kac-ft)	0	0.35	0	0	0	0	0	0	0	2.03
	TP Load (mt)	0	0.01	0	0	0	0	0	0	0	0.07
	TP FWM (ppb)	NF	20	NF	NF	NF	NF	NF	NF	NF	26

¹Pump stations ACME1 and ACME2 stopped operation in December 2006.

²NF = no flow for period.

Table 1. Continued.

Non-ECP Basin Structures into Water Conservation Area 3 (WCA-3A)											
	Water Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
S-190	Flow Vol. (kac-ft)	111.50	89.58	142.47	67.03	24.02	83.09	86.35	40.24	49.99	25.15
	TP Load (mt)	13.65	10.69	27.20	17.77	2.99	14.06	7.79	2.24	2.53	3.02
	TP FWMC (ppb)	99	97	155	215	101	137	73	45	41	97
S-140	Flow Vol. (kac-ft)	136.15	137.98	203.58	88.52	90.34	136.31	136.94	77.69	85.59	73.31
	TP Load (mt)	7.02	7.22	12.51	5.12	4.05	6.65	9.21	3.77	5.06	4.48
	TP FWMC (ppb)	42	42	50	47	36	40	55	39	48	50
G-123	Flow Vol. (kac-ft)	2.30	0	0	0	0	0	0	0	0	0
	TP Load (mt)	0.05	0	0	0	0	0	0	0	0	0
	TP FWMC (ppb)	16	NF ¹	NF	NF	NF	NF	NF	NF	NF	NF
S-9	Flow Vol. (kac-ft)	149.71	93.40	128.47	42.46	52.63	54.68	119.30	58.17	113.69	166.72
	TP Load (mt)	3.39	2.14	3.06	1.00	1.28	1.30	2.95	0.97	2.18	3.25
	TP FWMC (ppb)	18	19	19	19	20	19	20	13	16	16
S-9A	Flow Vol. (kac-ft)	107.61	56.58	61.35	81.35	87.80	88.50	56.05	90.05	77.41	80.76
	TP Load (mt)	1.74	0.83	1.21	1.31	1.52	1.26	0.91	1.36	1.30	1.06
	TP FWMC (ppb)	13	12	16	13	14	12	13	12	14	11
Total (WCA-3A)	Flow Vol. (kac-ft)	513.47	382.54	543.75	279.36	254.79	362.57	398.63	266.14	326.68	345.95
	TP Load (mt)	26.60	21.48	45.49	25.19	9.84	23.27	20.86	8.35	11.06	11.81
	TP FWMC (ppb)	42	46	68	73	31	52	42	25	27	28

¹NF = no flow for period.

Table 1. Continued.

Non-ECP Basin Structures into Everglades National Park (ENP)											
	Water Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
S-174	Flow Vol. (kac-ft)	5.48	30.06	9.20	0.001	0 ¹	0	0	0	0	0
	TP Load (mt)	0.04	0.45	0.16	0.00	0	0	0	0	0	0
	TP FWMC (ppb)	6	12	14	5	NF ²	NF	NF	NF	NF	NF
S-175	Flow Vol. (kac-ft)	N/A ³	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TP Load (mt)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TP FWMC (ppb)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
S-18C	Flow Vol. (kac-ft)	158.81	100.69	188.51	80.36	124.38	173.10	249.36	130.13	104.72	149.23
	TP Load (mt)	1.85	0.99	3.30	0.69	1.16	1.55	1.95	1.21	1.21	1.79
	TP FWMC (ppb)	9	8	14	7	8	7	6	8	9	10
S-332	Flow Vol. (kac-ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TP Load (mt)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	TP FWMC (ppb)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
S-332D	Flow Vol. (kac-ft)	128.00	76.48	153.80	45.05	32.69	144.49	181.20	105.08	65.55	133.14
	TP Load (mt)	0.91	0.59	2.06	0.30	0.26	1.28	1.82	1.89	0.56	1.04
	TP FWMC (ppb)	6	6	11	5	6	7	8	15	7	6
Total (ENP)	Flow Vol. (kac-ft)	292.30	207.23	351.51	125.41	157.07	317.59	430.55	235.21	170.27	282.36
	TP Load (mt)	2.79	2.02	5.51	0.99	1.42	2.83	3.77	3.10	1.77	2.83
	TP FWMC (ppb)	8	8	13	6	7	7	7	11	8	8

¹Structure S-174 was plugged in September 2007.²NF = no flow for the period.³N/A = not applicable; flow and load calculation at S-175 and S-332 replaced in WY2001 with S-174 and S-332D.

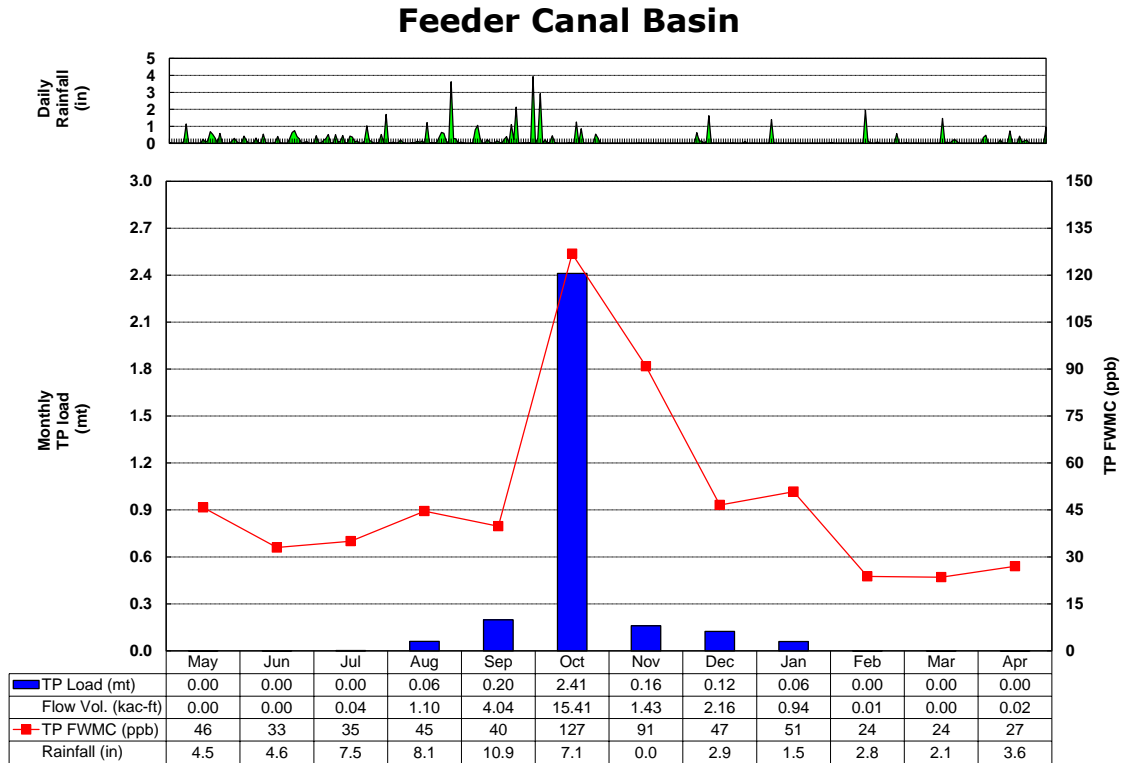


Figure 1. Feeder Canal Basin daily rainfall (top) and monthly total phosphorus (TP) load, flow-weighted mean (FWM) TP concentration, rainfall, and flow volume to the Everglades Protection Area (EPA) for Water Year (WY2013) (May 1, 2012–April 30, 2013 (bottom). [Note: FWM = flow-weighted mean concentration, in = inches, kac-ft = thousand acre-feet, mt = metric tons, ppb = parts per billion. For the months of May and June 2012 and March 2013, the monthly flow is less than 0.005 kac-ft and is rounded to 0.00 kac-ft.]

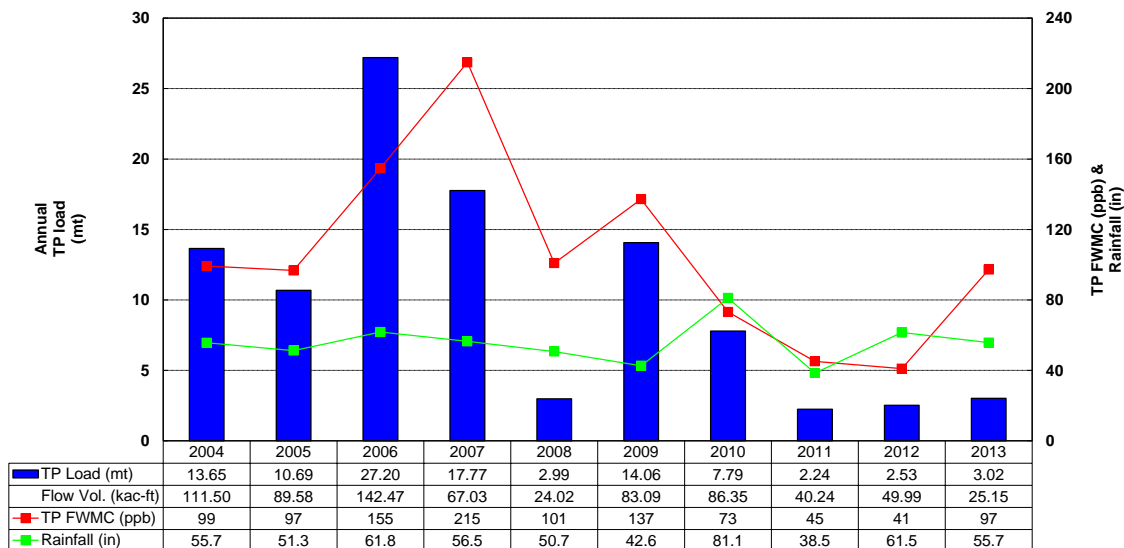


Figure 2. Feeder Canal Basin annual TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY2004–WY2013.

L-28 Basin

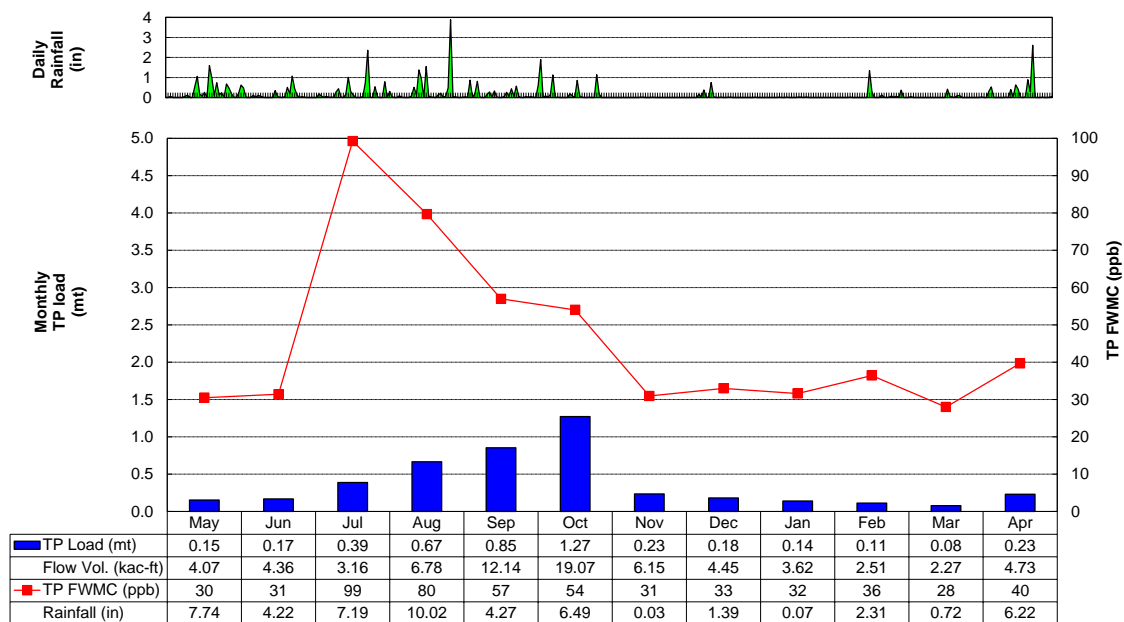


Figure 3. L-28 Basin daily rainfall (top) and monthly TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY2013 (bottom).

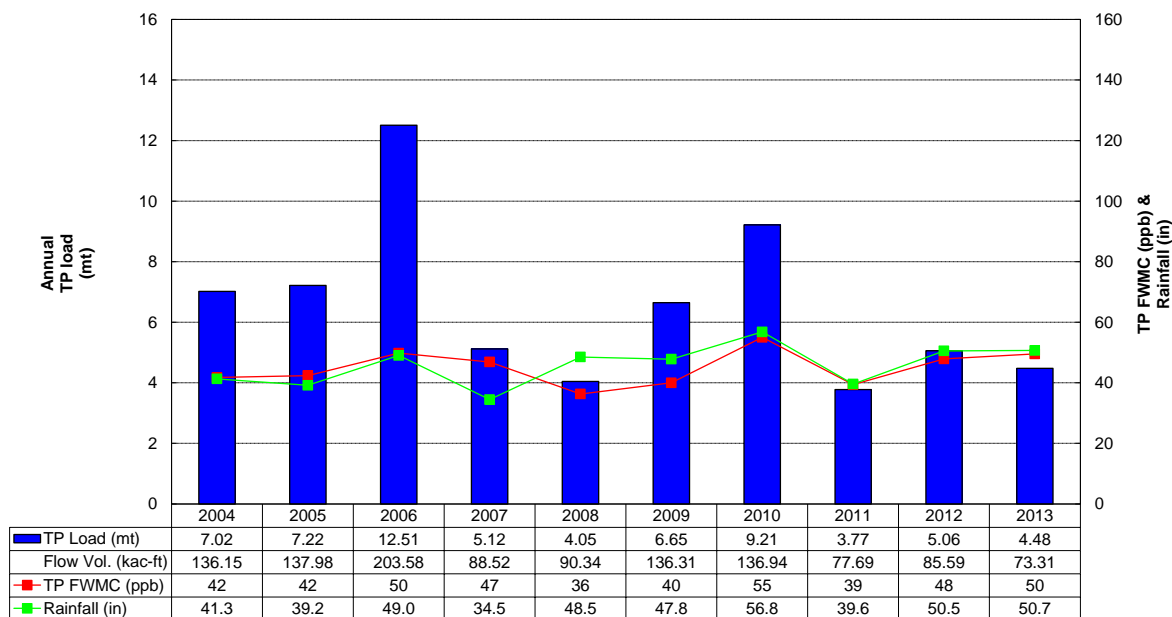


Figure 4. L-28 Basin annual TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY2004–WY2013.

C-111 Basin

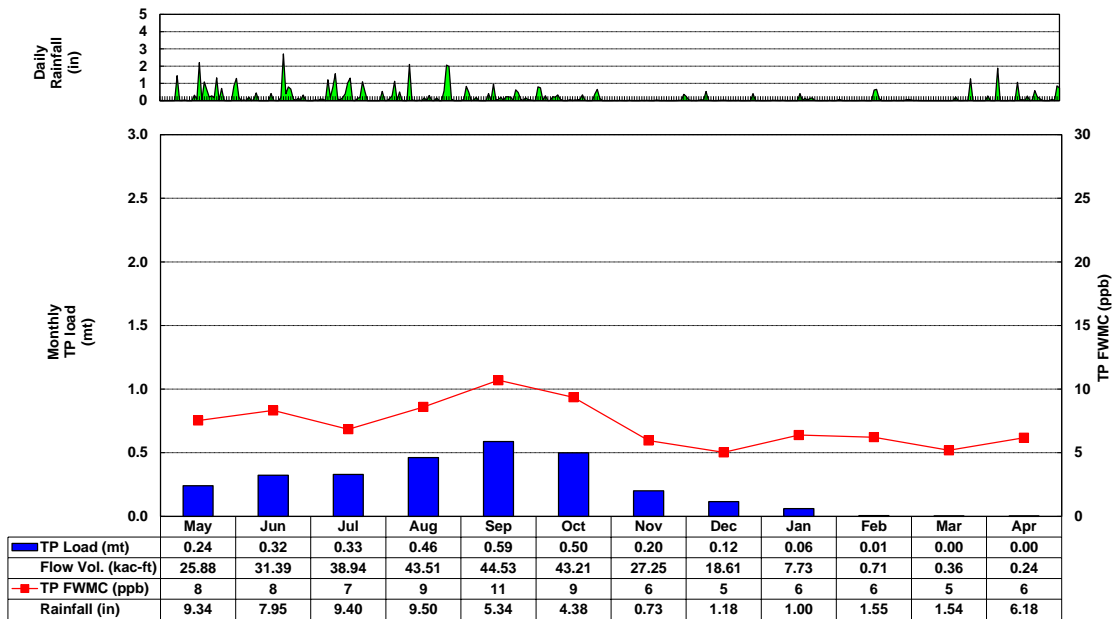


Figure 5. C-111 Basin daily rainfall (top) and the monthly TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY2013 (bottom).

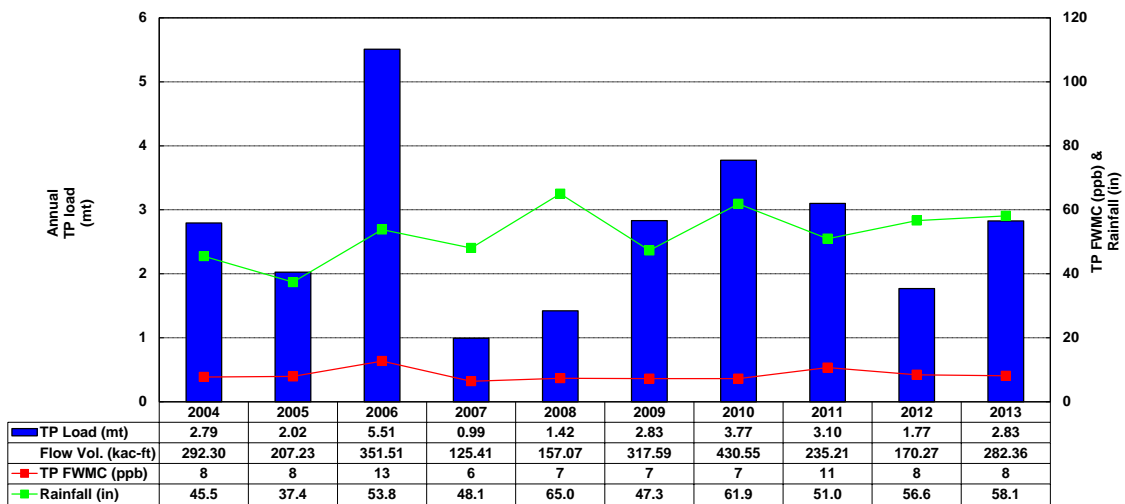


Figure 6. C-111 Basin annual TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY2004–WY2013. [Notes: WY2004–WY2008 represented by structures S-18C, S-174, and S-332D. Structure S-174 was plugged in September 2007.]

C-11 West

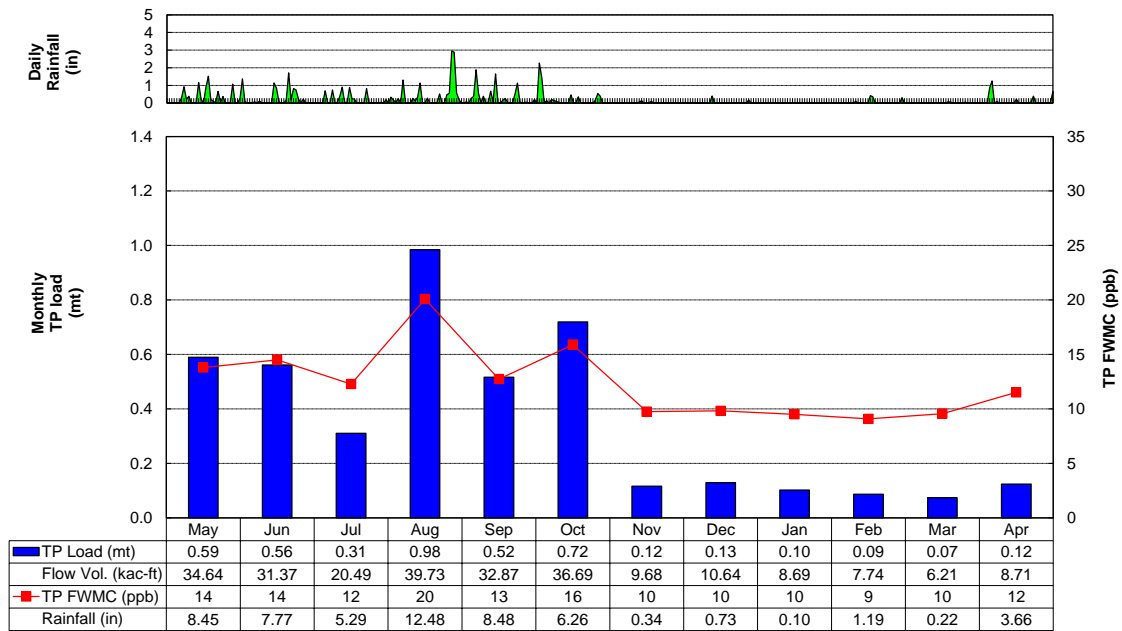


Figure 7. C-11 West Basin daily rainfall (top) and the monthly TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY2013 (bottom).

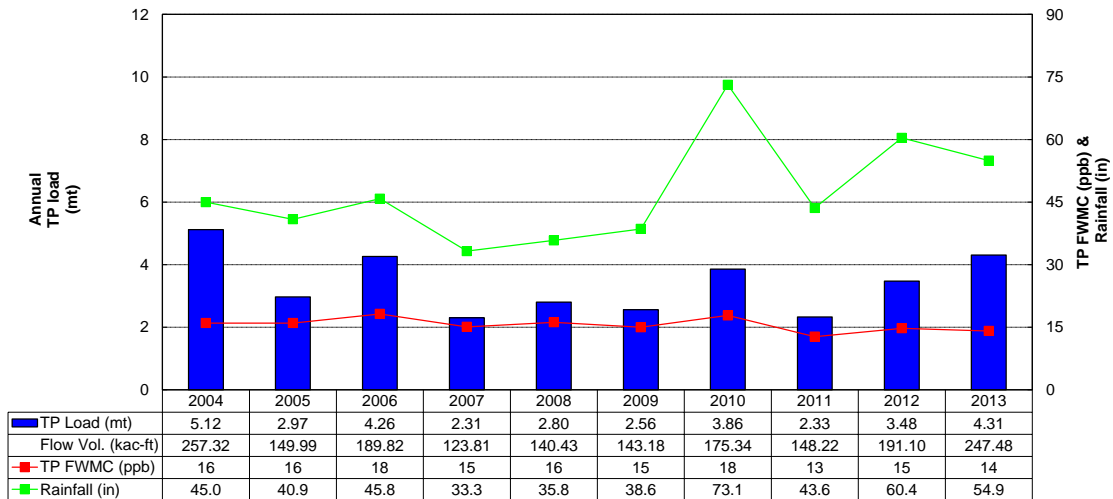


Figure 8. C-11 West Basin annual TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY2004–WY2013.

North New River Canal Basin

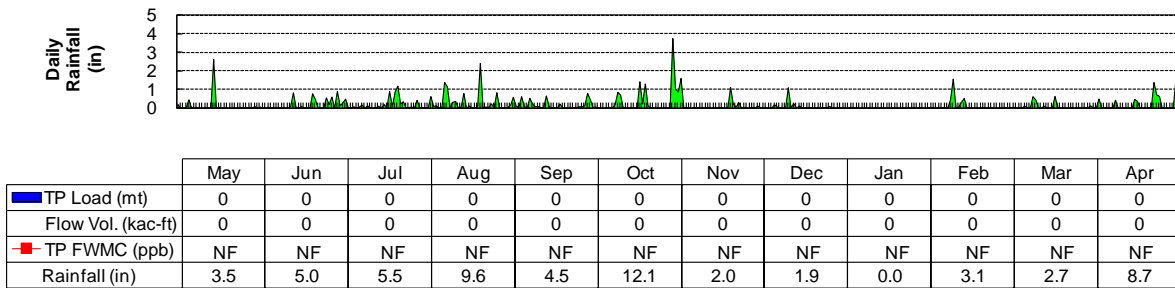


Figure 9. North New River Canal Basin daily rainfall (top) and monthly TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY2013 (bottom). [Note: NF = no flow for the period.]

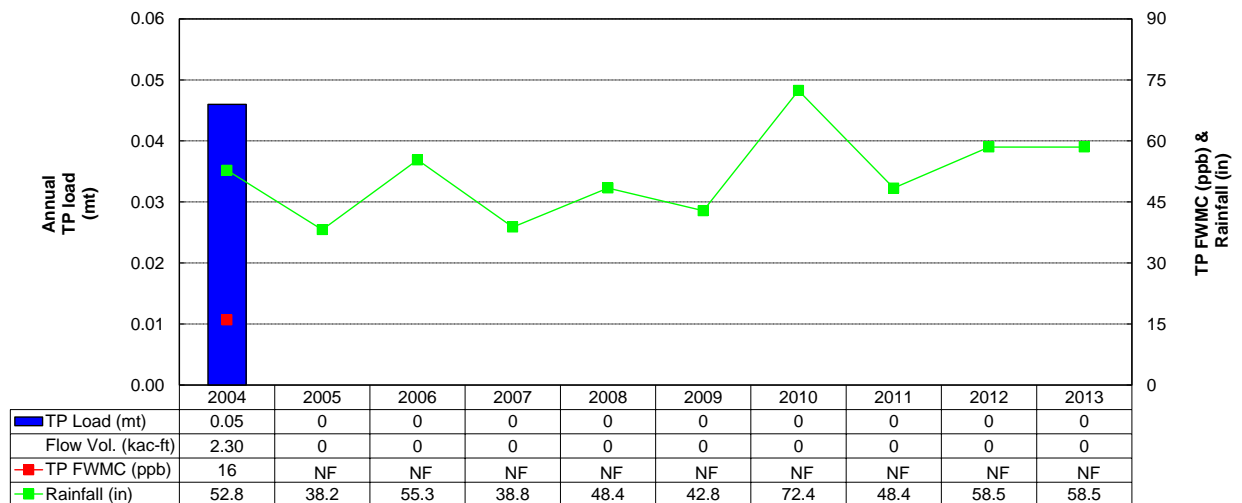


Figure 10. North New River Canal Basin annual TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY2004-Y2013. [Note: NF = no flow for the period.]

North Springs Improvement District Basin

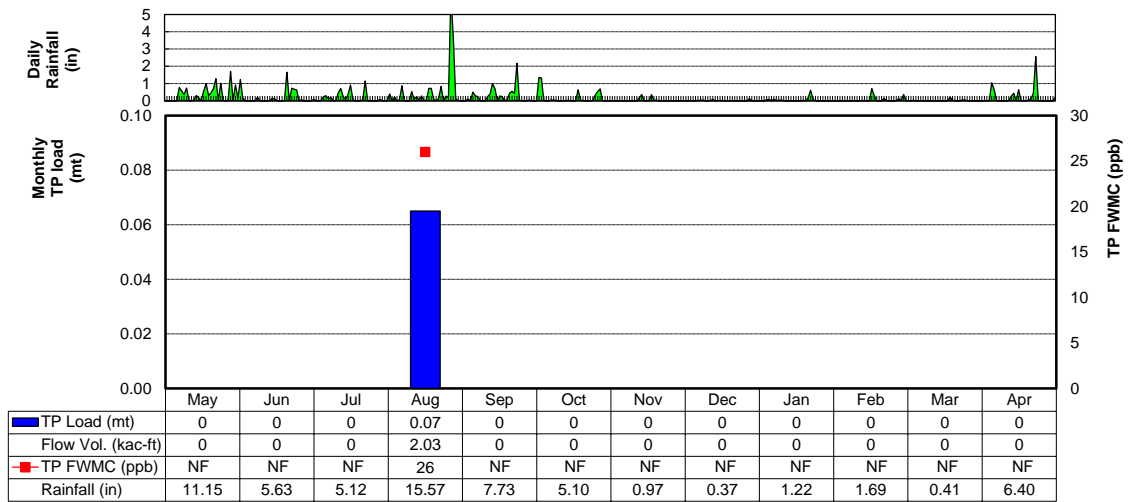


Figure 11. North Springs Improvement District Basin daily rainfall (top) and monthly TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY2013 (bottom). [Note: NF = no flow for the period.]

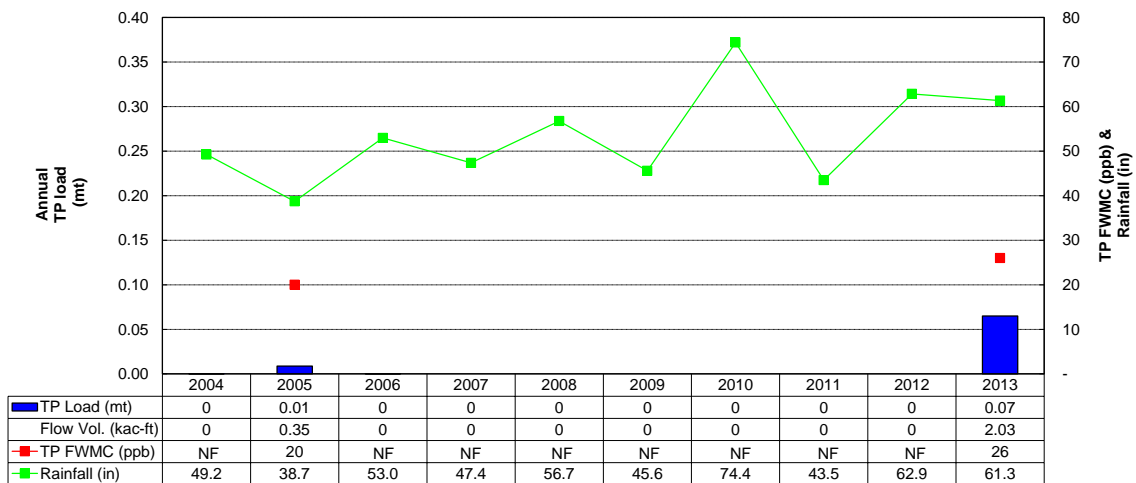


Figure 12. North Springs Improvement District Basin annual TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY2004–WY2013. [Note: NF = no flow for the period, NDF = no data with flow available.]

Acme Improvement District Basin

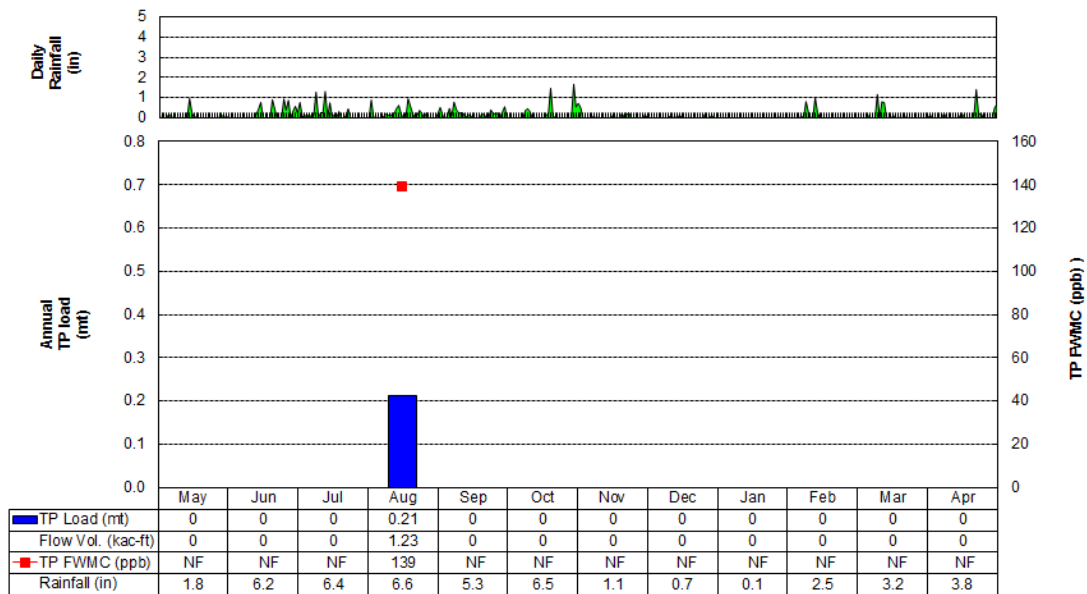


Figure 13. Acme Improvement District Basin daily rainfall (top) and monthly TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY2013 (bottom). [Note: NF = no flow for period.]

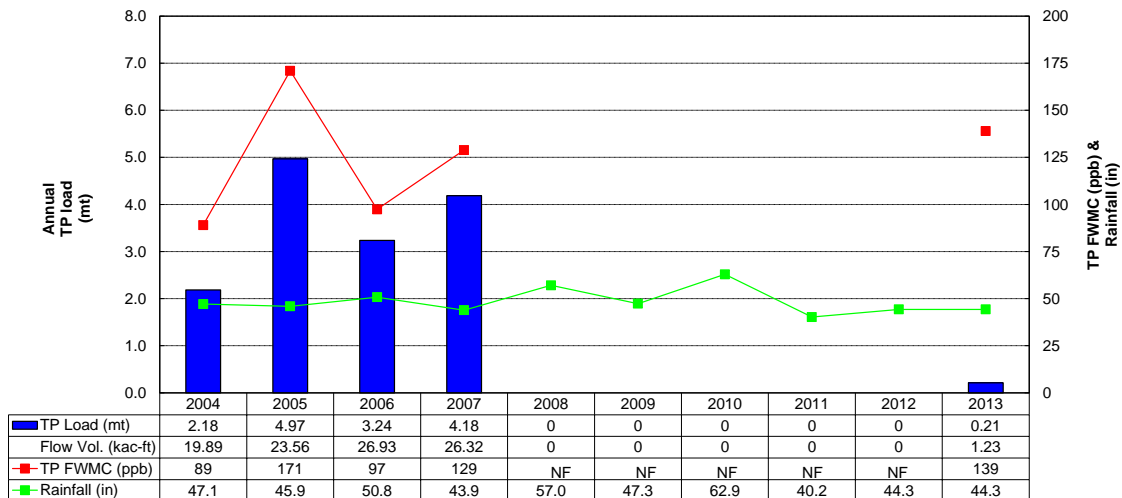


Figure 14. Acme Improvement District Basin annual TP load, FWM TP concentration, rainfall, and flow volume to the EPA for WY2004–WY2013. [Notes: NF = no flow for the period. Pump stations ACME1 and ACME2 stopped operation in December 2006.]

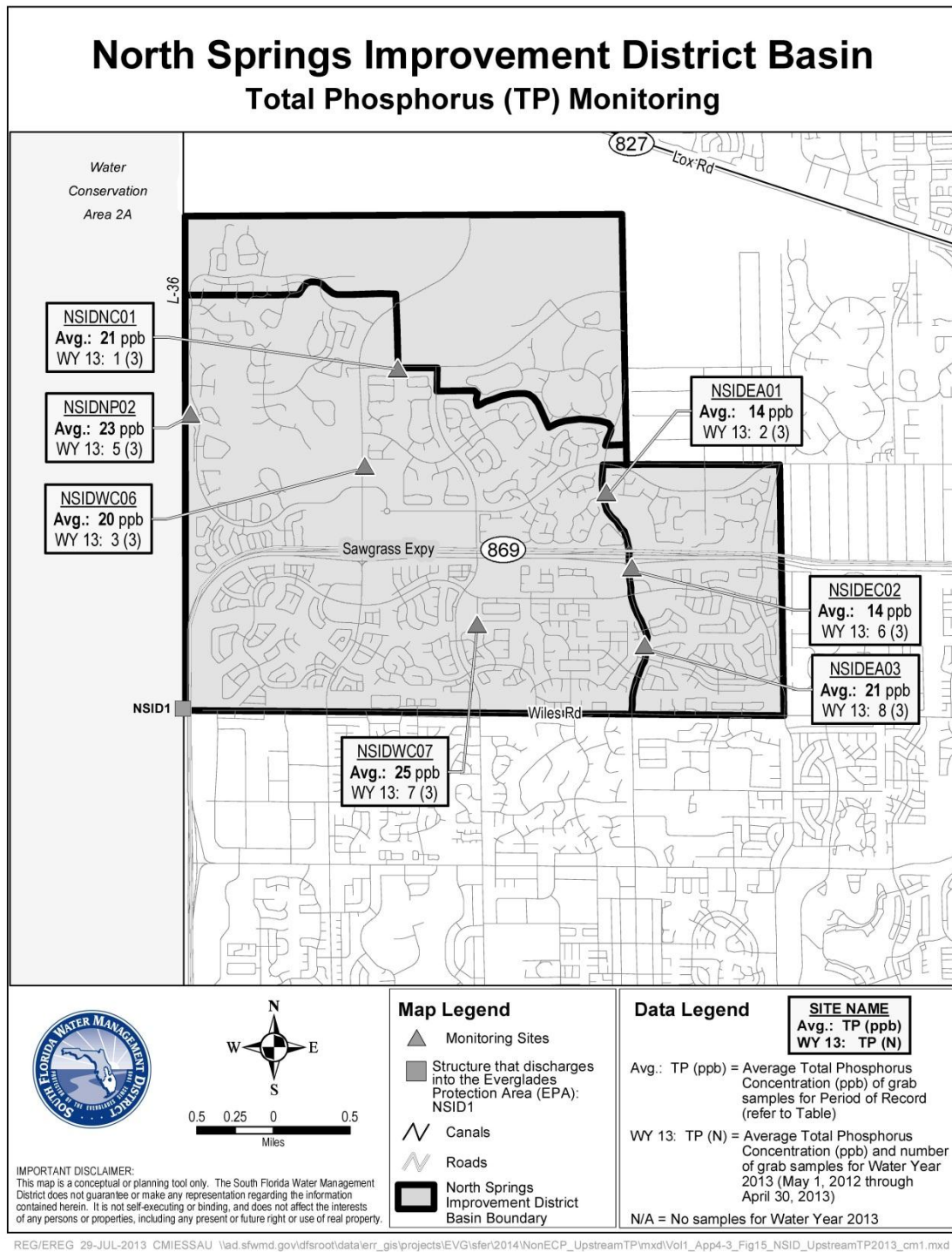


Figure 15. Summary of TP data for North Springs Improvement District Basin upstream monitoring sites.

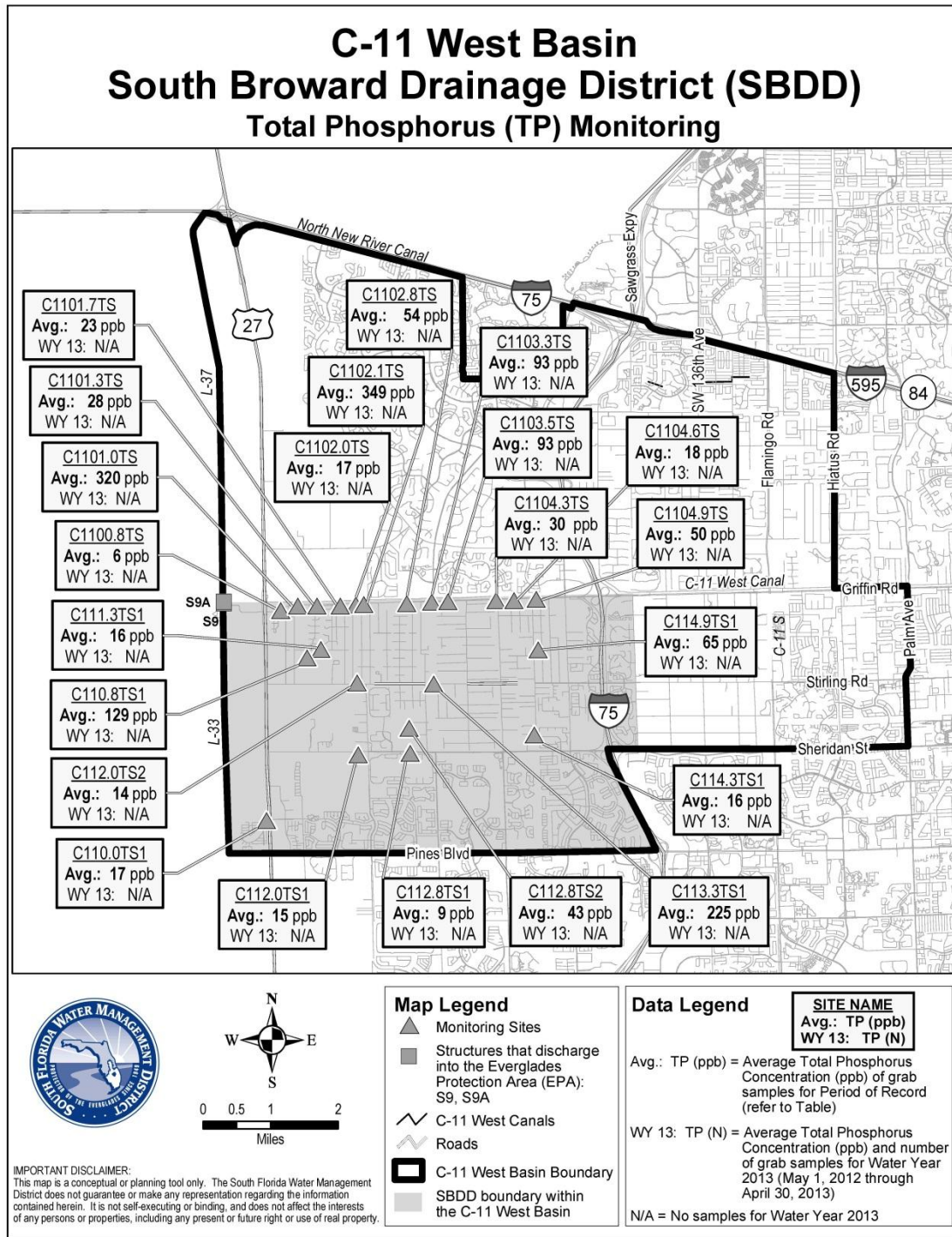
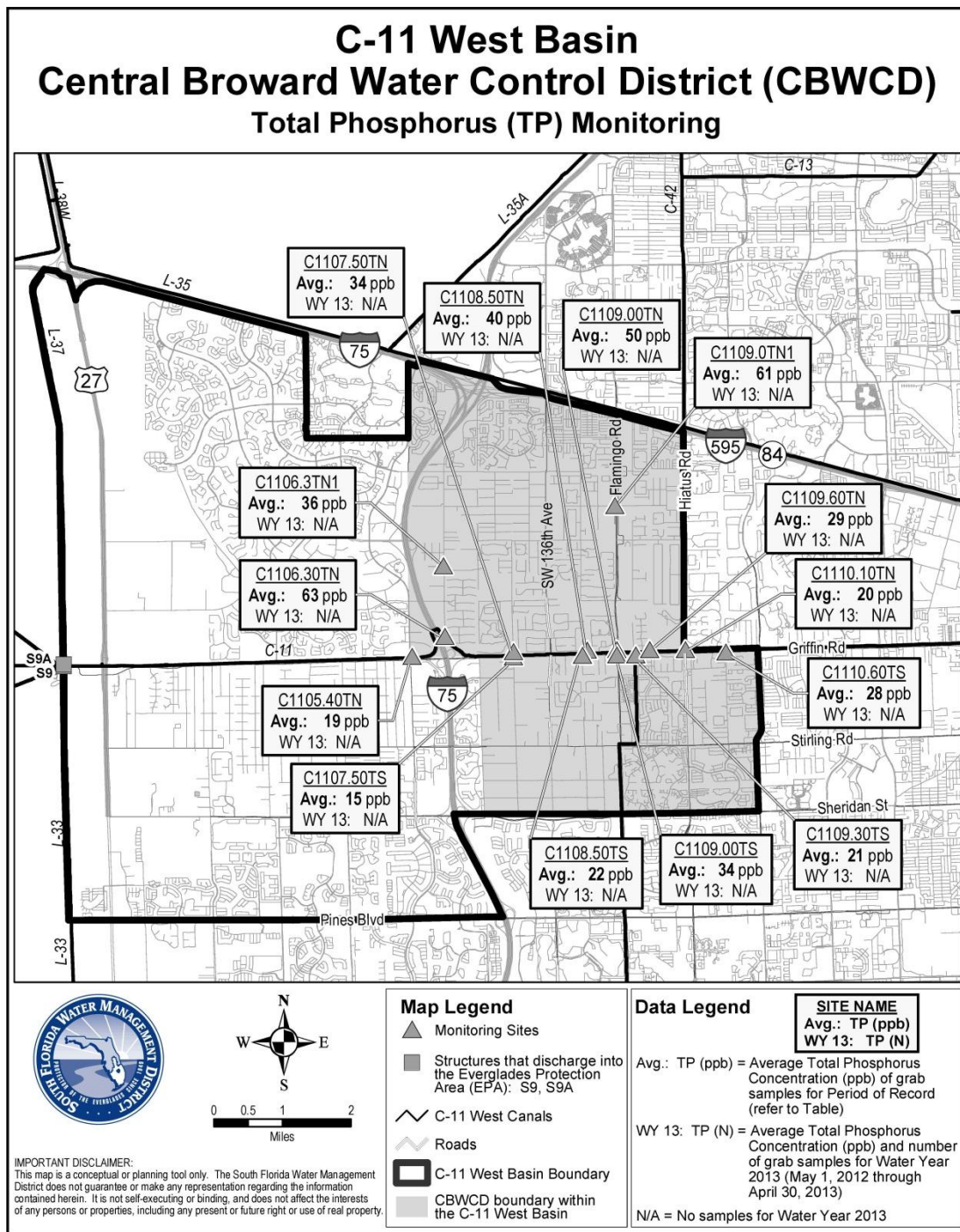


Figure 16. Summary of TP data for South Broward Drainage District upstream monitoring sites within the C-11 West Basin.



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Figure 17. Summary of TP data for Central Broward Water Control District upstream monitoring sites within the C-11 West Basin.

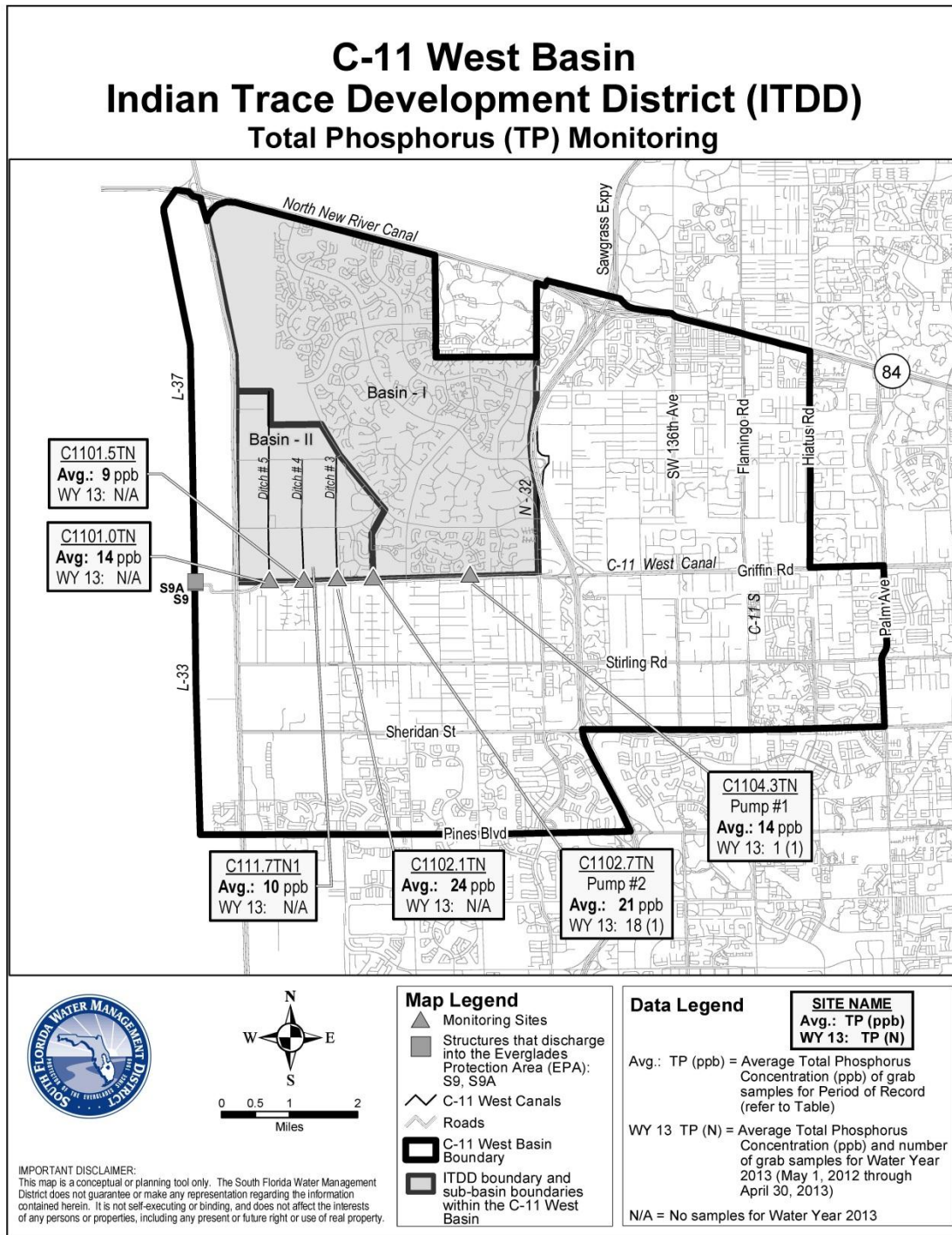


Figure 18. Summary of TP data for Indian Trace Drainage District upstream monitoring sites within the C-11 West Basin.

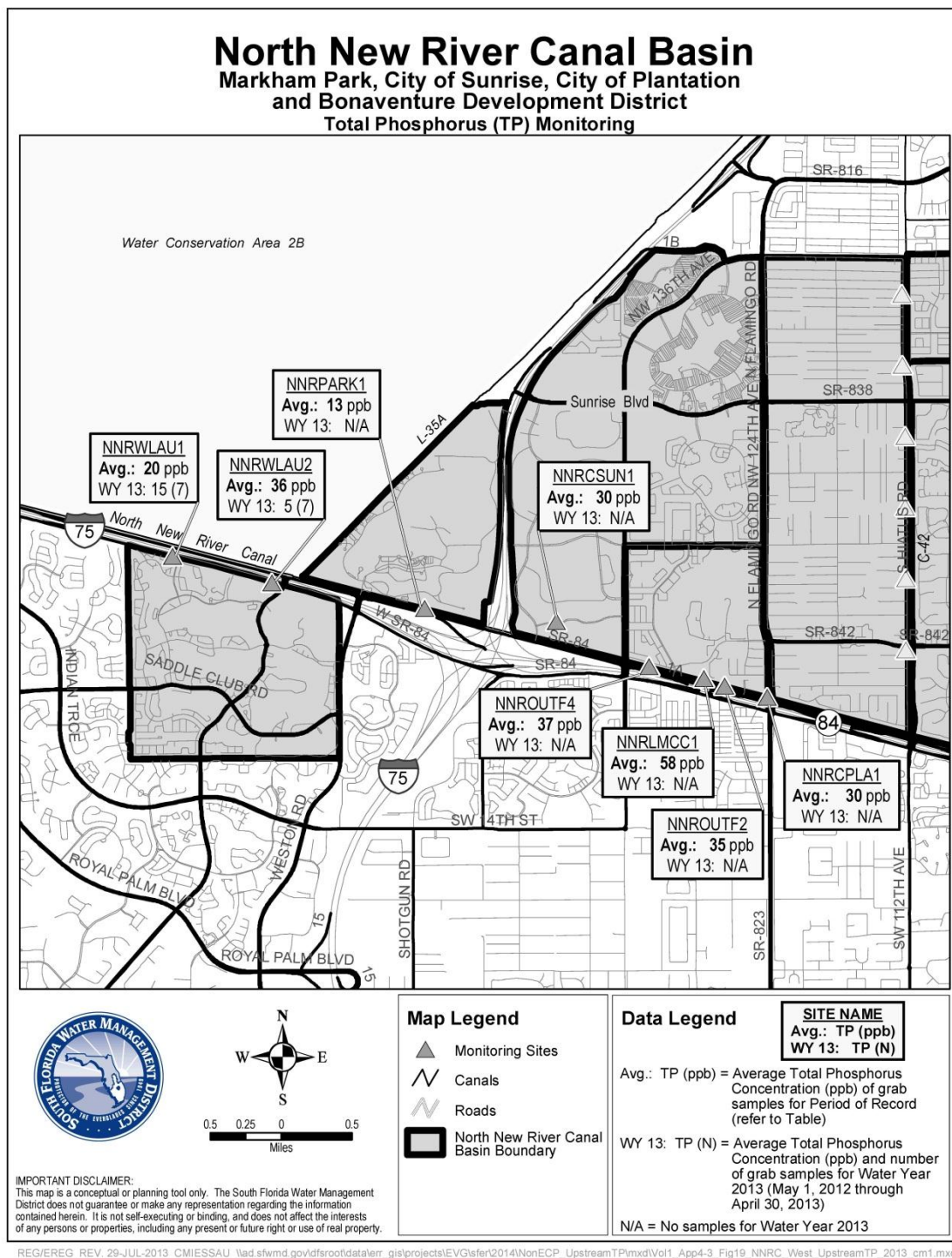


Figure 19. Summary of TP data for North New River Canal Basin (west) upstream monitoring sites.

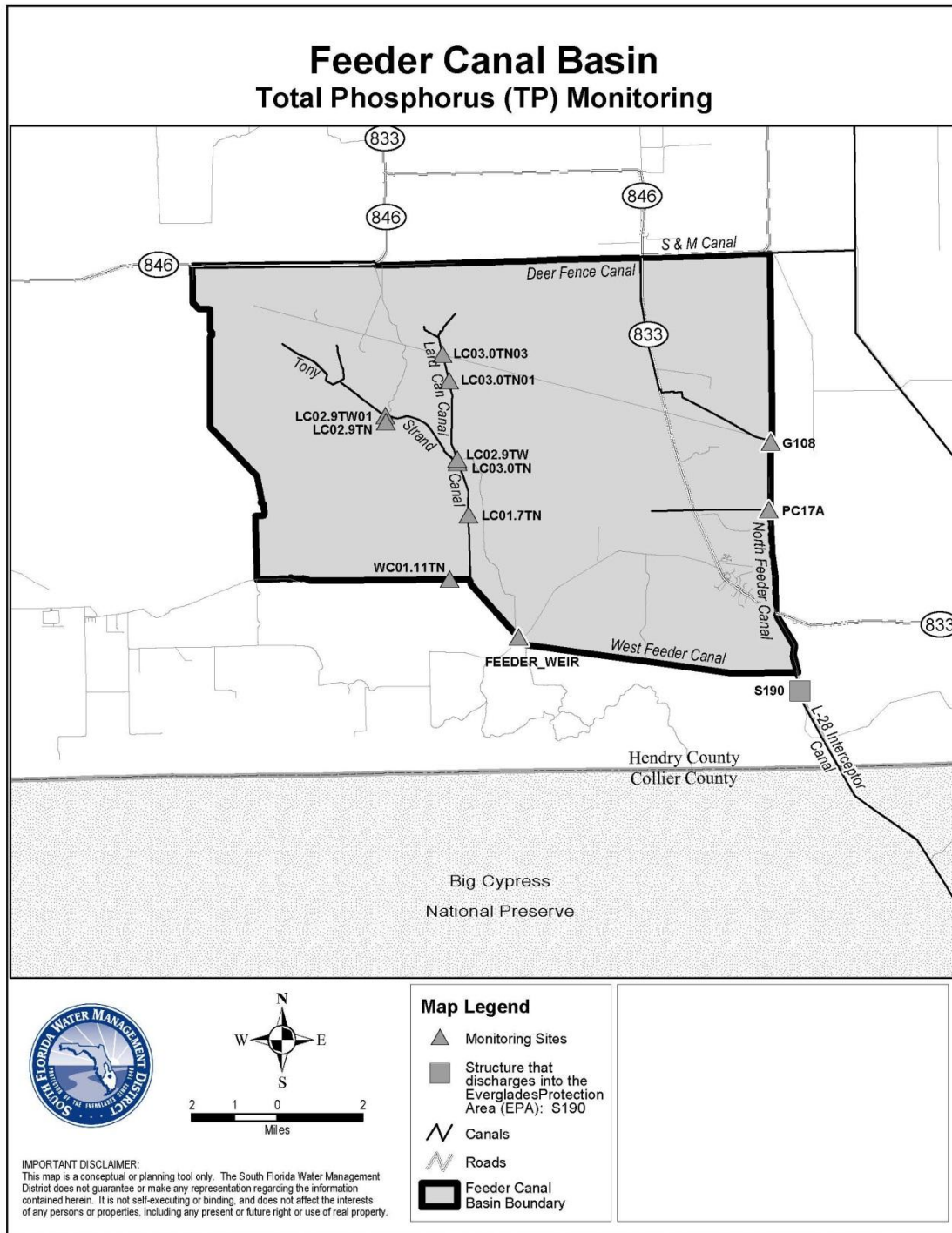


Figure 20. Location map of Feeder Canal Basin upstream monitoring sites.
[Note: Additional upstream monitoring data available in the 2011, 2012, and 2013 SFERs – Volume I, Appendix 4-3 and synoptic survey data available in the 2006 SFER – Volume I, Appendix 3-2f.]

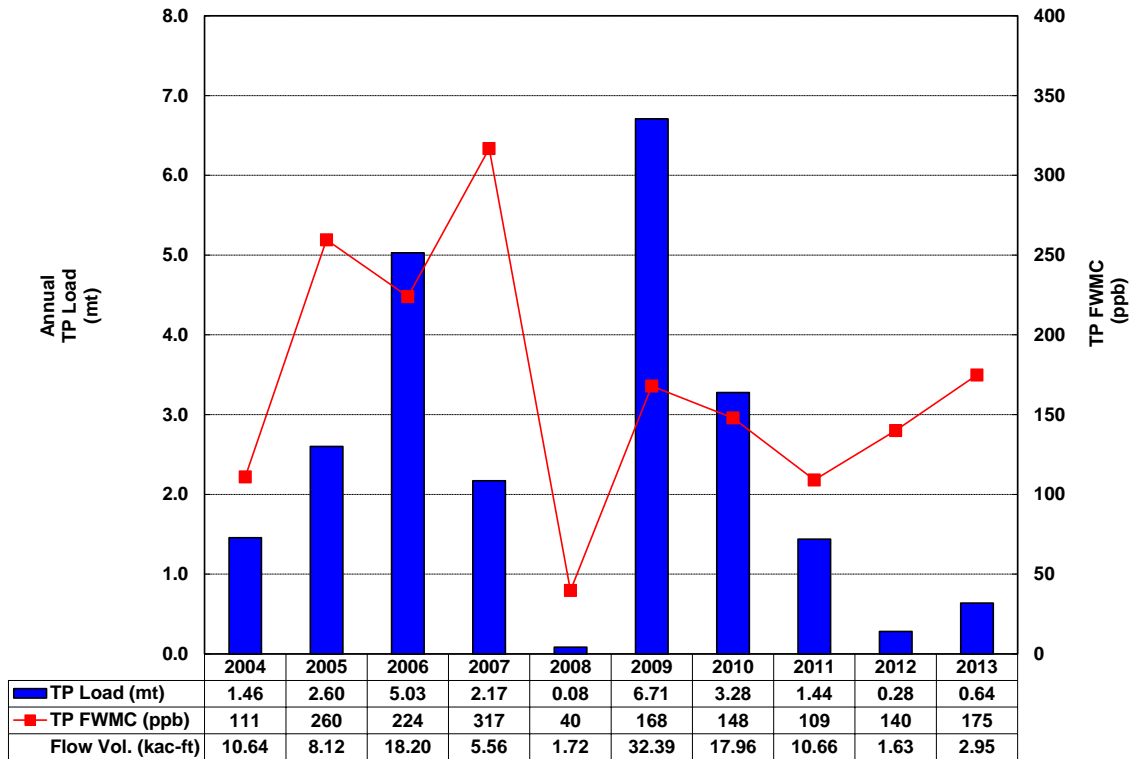


Figure 21. TP load, TP FWMC, and flow volume for upstream structure PC-17A in the Feeder Canal Basin from WY2004–WY2013.

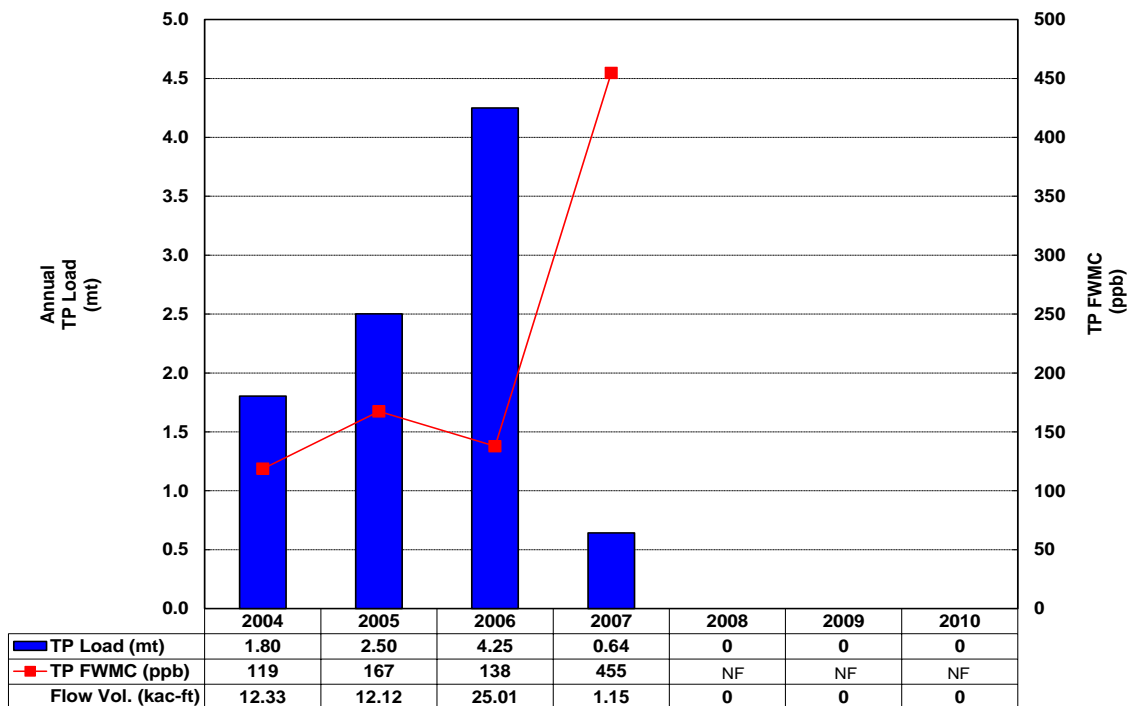


Figure 22. TP load, TP FWMC, and flow volume for upstream structure G-108 in the Feeder Canal Basin for WY2004–WY2010 [Notes: NF = no flow for period. Structure G-108 was removed in April 2010.]

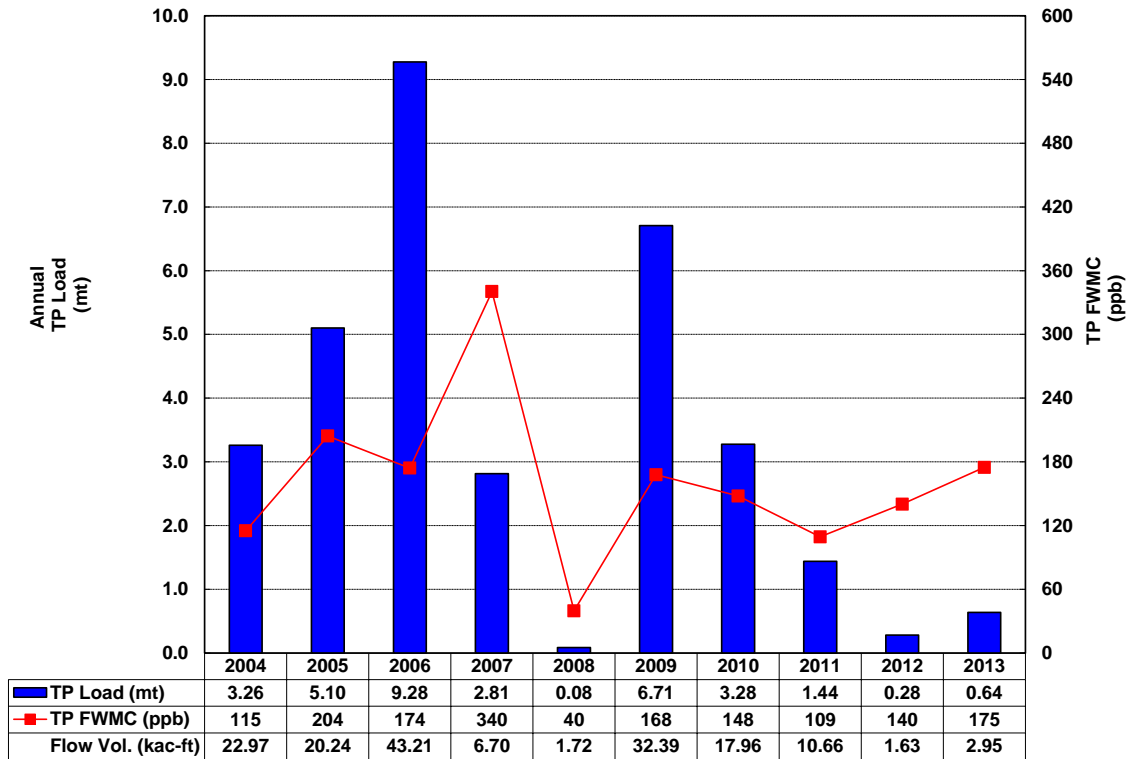


Figure 23. TP load, TP FPMC, and flow volume for upstream combined structures PC-17A and G-108 in the Feeder Canal Basin for WY2004-WY2013.

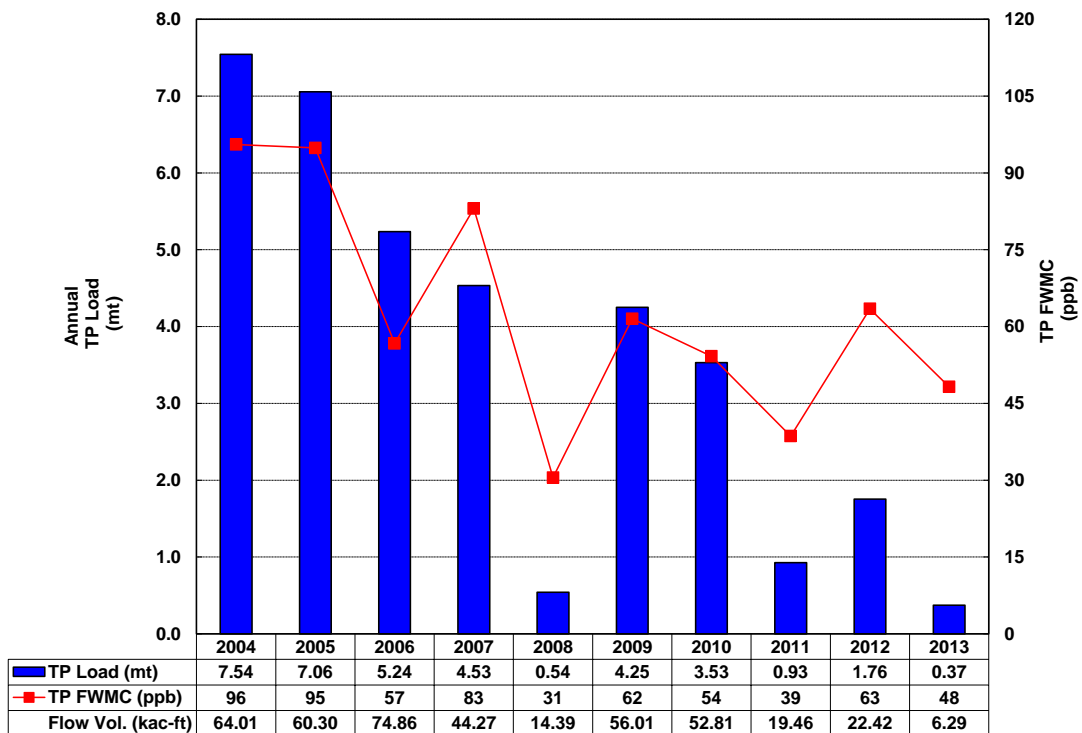


Figure 24. TP load, TP FPMC, and flow volume for upstream structure WWEIR in the Feeder Canal Basin for WY2004-WY2013.

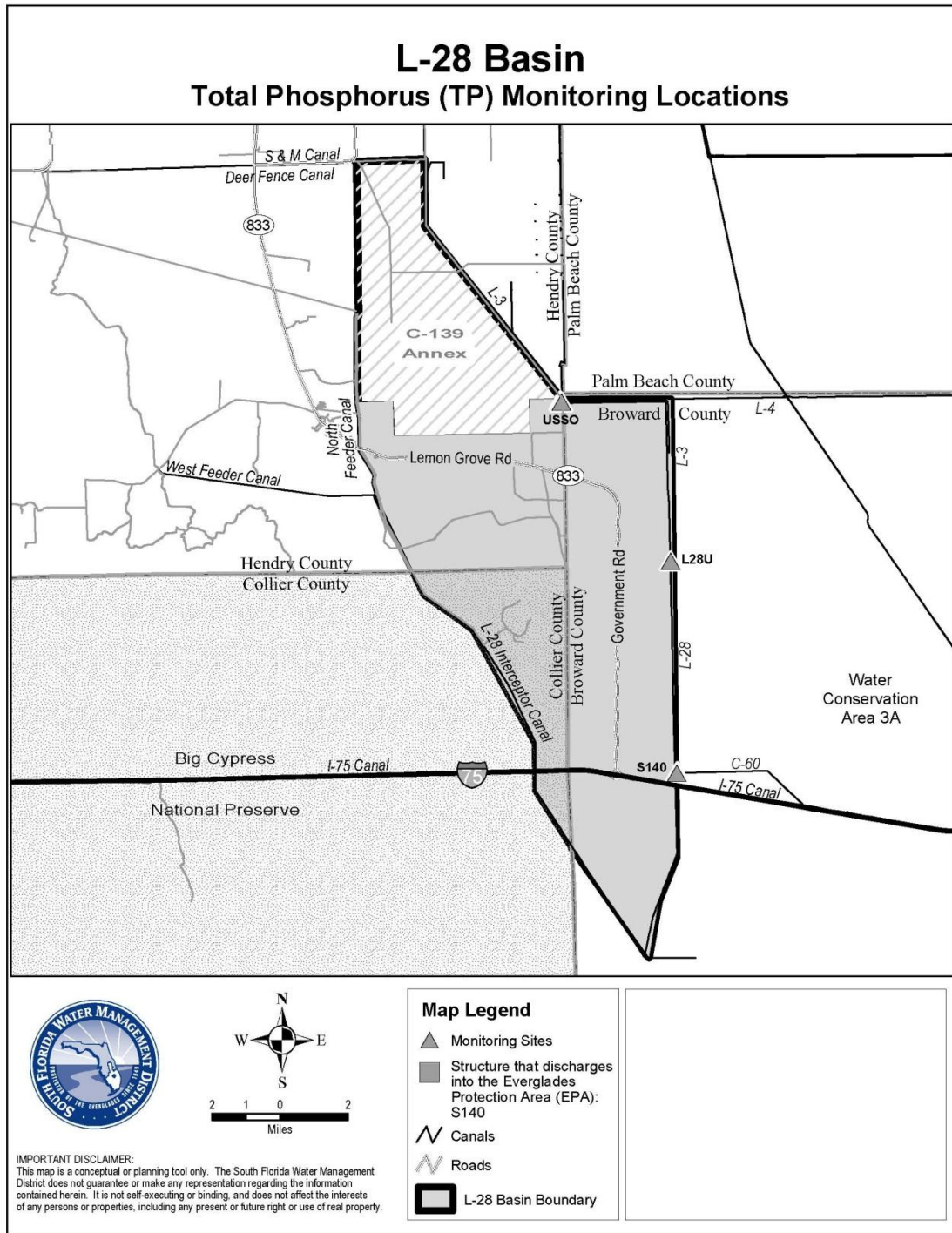


Figure 25. Location map of L-28 Basin upstream monitoring sites.

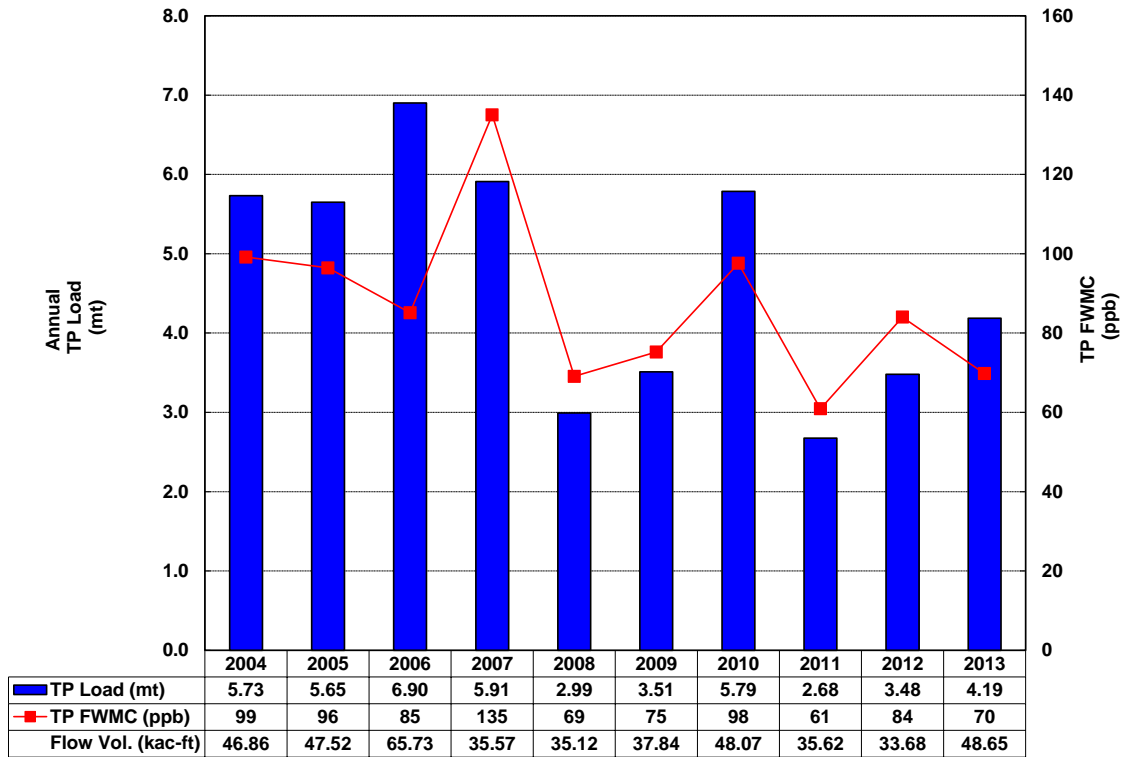


Figure 26. TP load, TP FWMC, and flow volume for upstream structure USSO in the L-28 Basin for WY2004-WY2013.

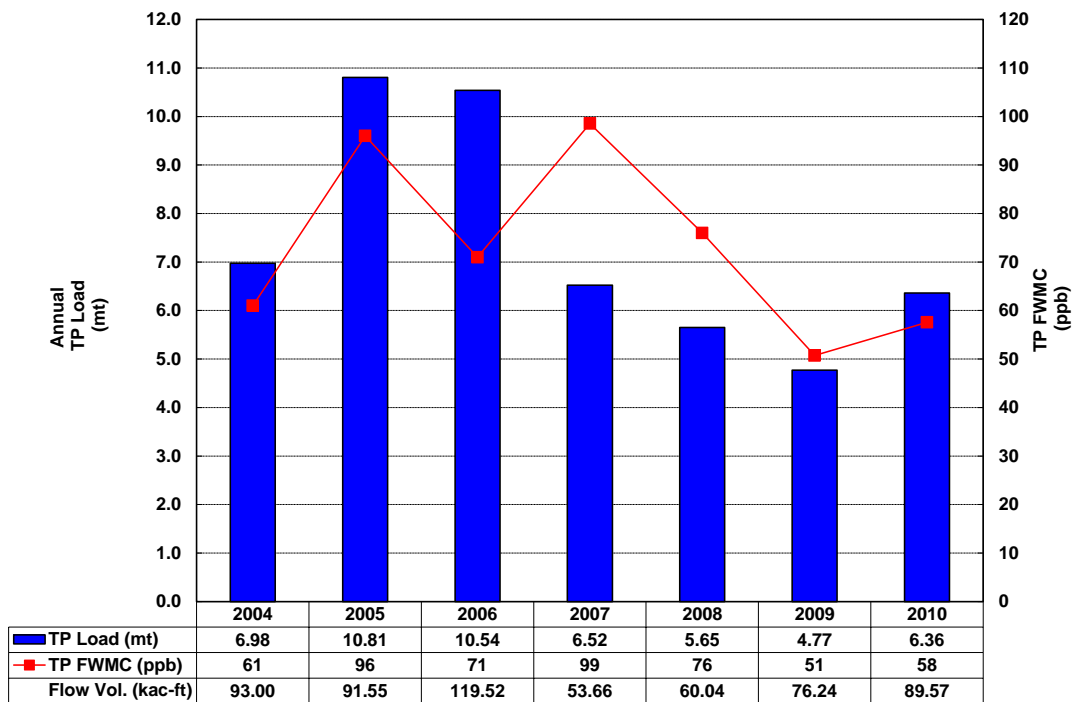
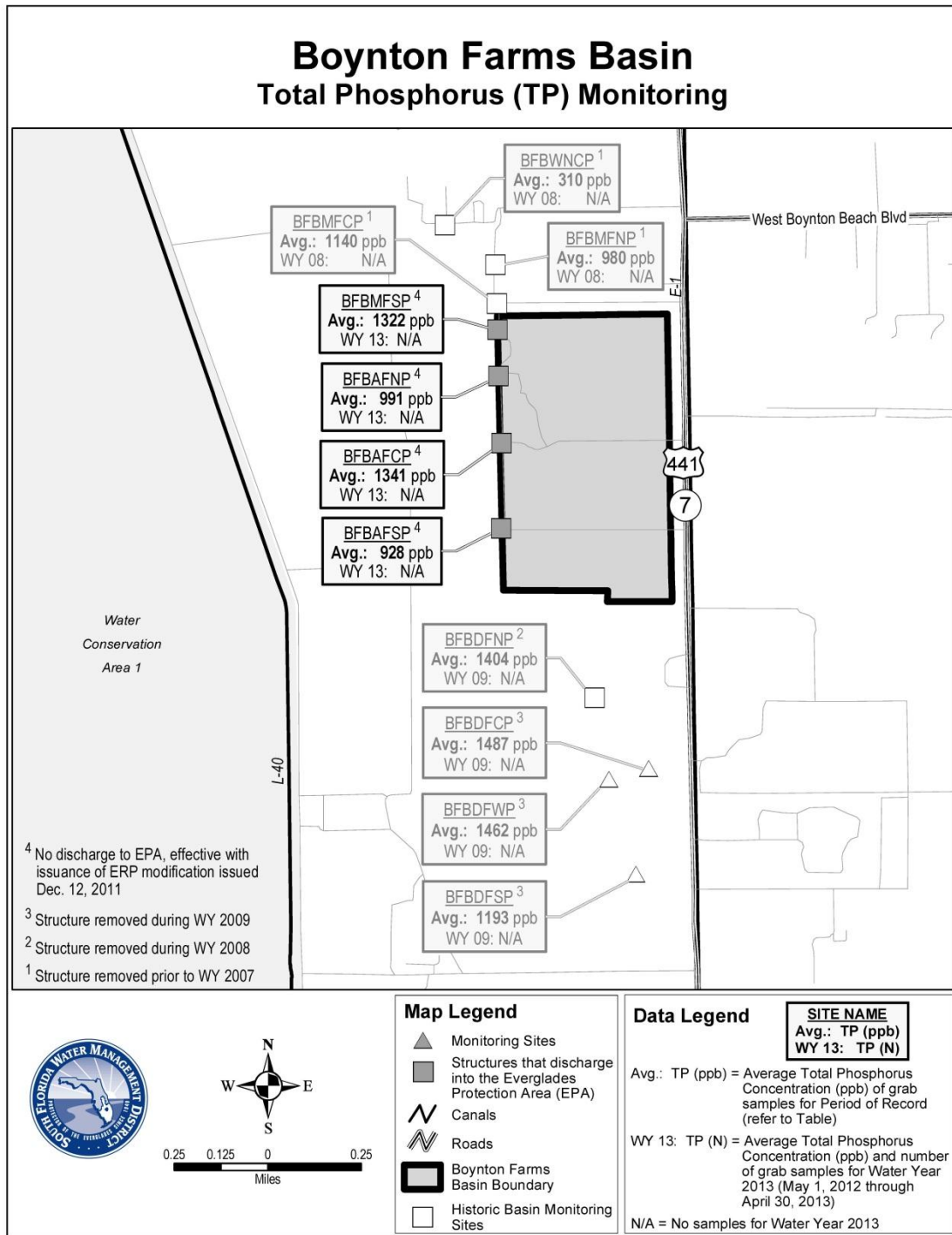


Figure 27. TP load, TP FWMC, and flow volume for upstream structure L28U in the L-28 Basin for WY2004-WY2010.



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Figure 28. Summary of TP data for Boynton Farms Basin monitoring sites.

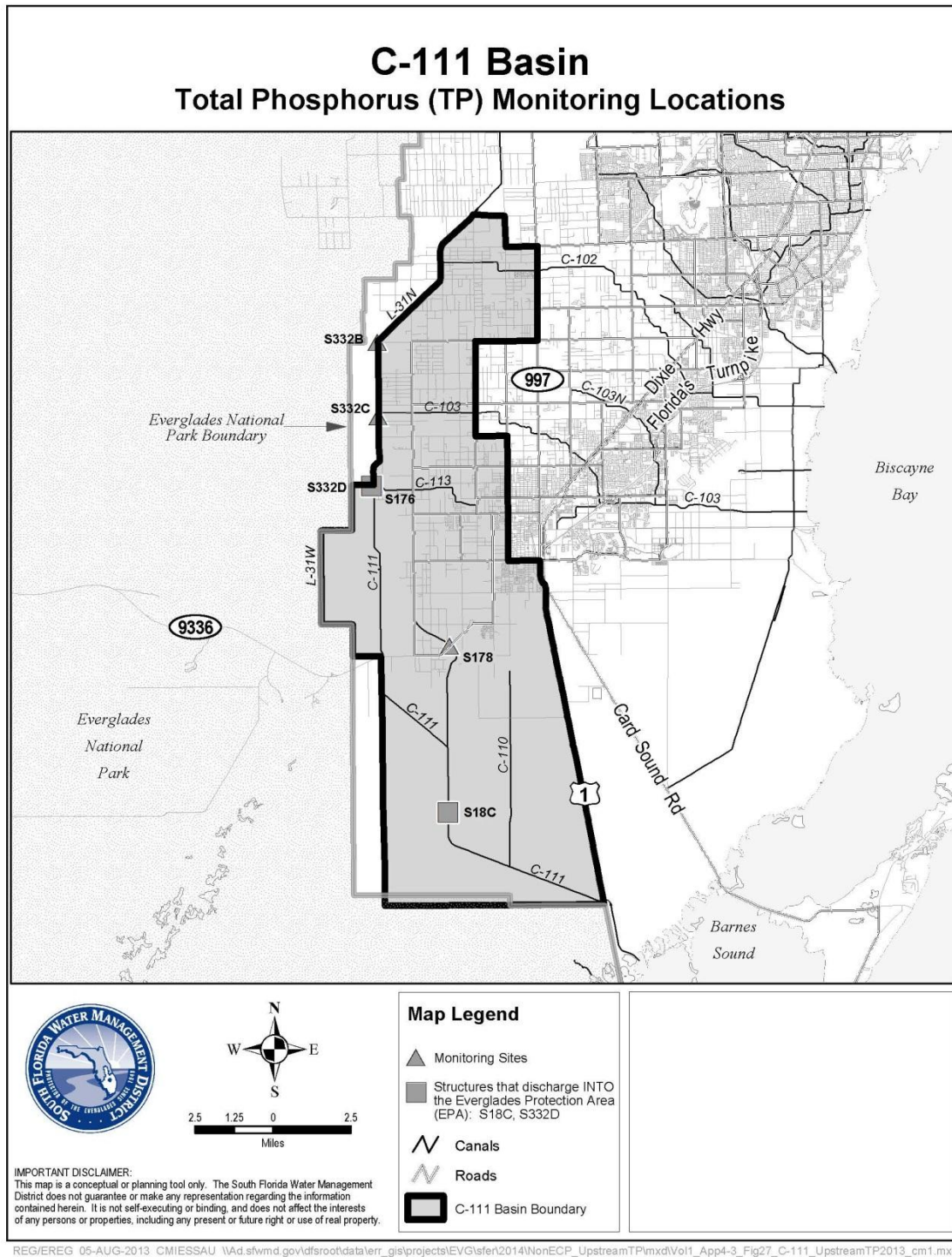


Figure 29. C-111 Basin monitoring sites
(see Volume III, Appendix 3-2, for upstream data).

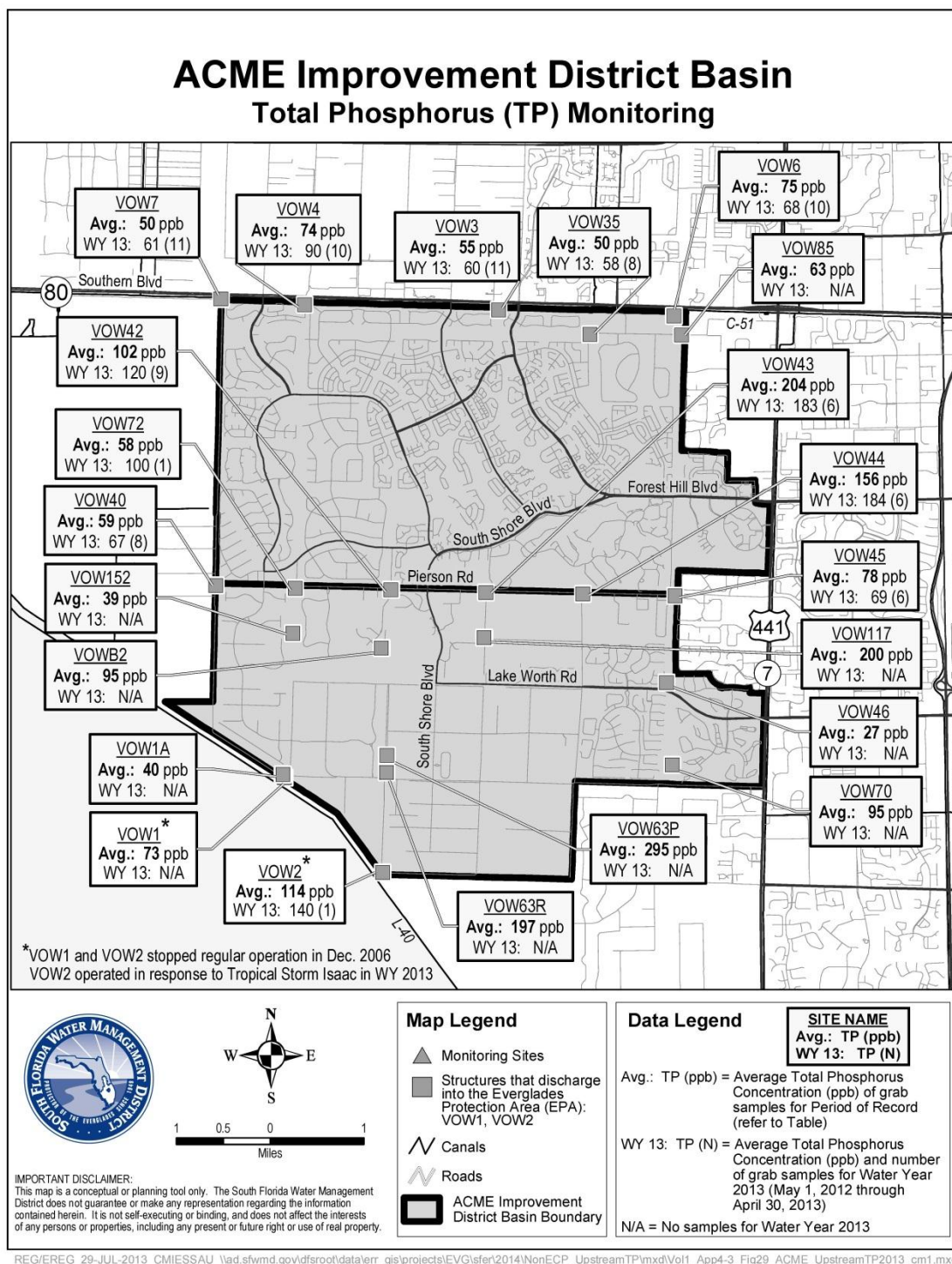


Figure 30. Summary of TP data for Village of Wellington upstream monitoring sites in the Acme Improvement District Basin.